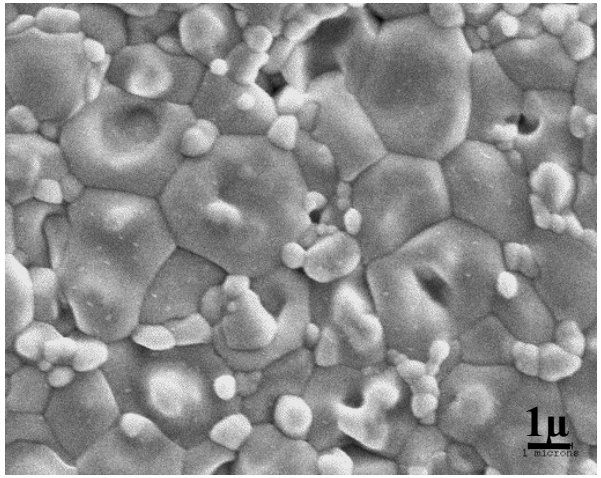
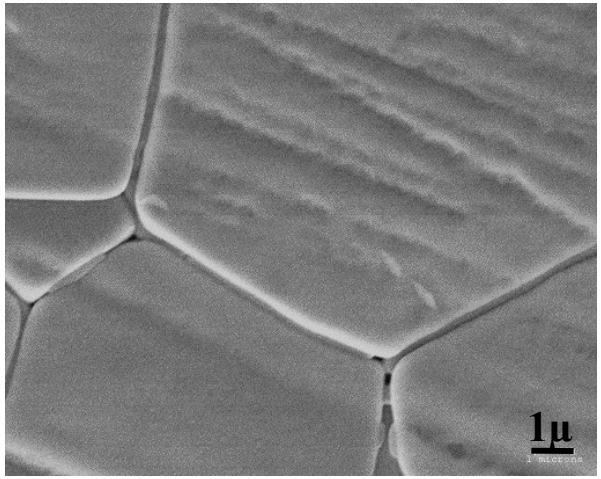
"New Ordered Perovskite Dielectrics for Microwave Applications"

Peter K Davies (PI), University of Pennsylvania, DMR-0213489

Microwave ceramics are critical components in wireless communications devices that filter and combine signals in the microwave region. This project is focused on the design of new ceramic materials to enable additional device miniaturization and enhanced signal resolution. The micrographs illustrate the effect of very low levels (< 0.5%) of a new tungsten oxide-based substituent on the microstructure of barium zinc niobate microwave ceramics. The substituted microwave ceramic (lower figure) can be fabricated at much lower temperatures that those currently used in existing technologies and improves the signal resolution by 100%. By understanding the specific roles of the additive in enhancing the properties, completely new materials based on this and other compositions are being developed.





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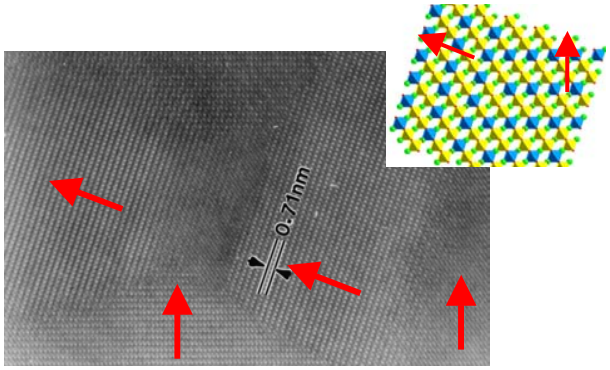
Education and Outreach:

This grant supported the research activities of undergraduate and graduate students involved in projects related to the synthesis, structure and property characterization of new ceramic materials for applications in microwave wireless communications. One student (Hui Wei) presented her work at national meetings of MRS and the American Ceramic Society. Two undergraduate students (Matt Dwyer and Josh Furman) were involved in measurements of thermal expansion and designing a new system for electronic characterization. All of the students interacted with local industries involved in the research and production of dielectric ceramics. Through visits to these plants the students are exposed to the challenges, and rewards, involved in translating their fundamental research to actual commercial products. Students in the PI's group have also participated in the teaching of labs in a summer program aimed toward introducing high school students to materials research.



Work by graduate student Niti Yongvanich, established a direct connection between the processing history and nano-level domain structures of ceramic microwave resonator pucks